

# A Longitudinal Study of Drinking and Cognitive Performance in Elderly Japanese American Men: The Honolulu–Asia Aging Study

## ABSTRACT

**Objectives.** This study prospectively describes the relationships between alcohol intake and subsequent cognitive performance among participants in the Honolulu Heart Program (HHP).

**Methods.** Alcohol intake was assessed at Exam III of the HHP, and cognitive performance was measured approximately 18 years later with the Cognitive Abilities Screening Instrument (CASI). Complete information was available for 3556 participants, aged 71 to 93 years at follow-up.

**Results.** In multivariate analyses, the relationship between drinking and later cognitive performance appeared nonlinear, as nondrinkers and heavy drinkers (more than 60 ounces of alcohol per month) had the lowest CASI scores and the highest risks of poor and intermediate CASI outcomes. Compared with nondrinkers, the risk of a poor CASI score was lowered by 22% to 40% among men who consumed 1–60 ounces of alcohol per month.

**Conclusions.** We report a positive association between moderate alcohol intake among middle-aged men and subsequent cognitive performance in later life. However, it is possible that the health risks associated with drinking outweigh any potential benefits for many elderly persons. (*Am J Public Health.* 2000;90:1254–1259)

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The relationship between alcohol consumption and cognitive performance among the elderly is contested. Alcohol may have neurotoxic effects,<sup>1,2</sup> and heavy alcohol use is associated with certain forms of dementia.<sup>3,4</sup> However, less is currently known about the effects of low and moderate levels of alcohol consumption on cognitive function in the elderly. Because dementia is a common and devastating condition among older adults,<sup>5</sup> even a modest effect of alcohol on cognition could have broad public health implications for the elderly.

There are surprisingly few population-based studies of alcohol consumption and cognition among elderly people.<sup>6–10</sup> A beneficial association between moderate levels of alcohol consumption and cognitive performance has been suggested,<sup>6,10</sup> although results have not been conclusive. Further, only 2 of these studies<sup>6,9</sup> have used longitudinal designs, and the temporality of the relationship between drinking and cognition cannot be accurately assessed with cross-sectional study designs. This is an important limitation, because cognitive functioning could plausibly influence alcohol consumption (reported or actual) rather than vice versa.<sup>9</sup> Additionally, the quality of the alcohol consumption data may be compromised in a cross-sectional study, either by responses from impaired participants or by reliance on information provided by their caretakers. In this report, we use longitudinal data from the Honolulu Heart Program (HHP) and its extension, the Honolulu–Asia Aging Study (HAAS), to examine associations between alcohol consumption and later cognitive performance among elderly Japanese American men.

## Methods

### Study Sample

Study participants were surviving members of the HHP cohort. The HHP was established in 1964 by the US National Heart, Lung

and Blood Institute as a prospective study of coronary heart disease and stroke among 8006 men of Japanese ancestry. The original sample was designed to include all noninstitutionalized Japanese American male residents of Oahu, Hawaii, born between 1900 and 1919. Further details of the study and of the selection of the cohort are available elsewhere.<sup>11–13</sup> There were 3 follow-up HHP examinations: Exam II (1968–1970), Exam III (1971–1974), and Exam IV (1991–1993). The HAAS examination, funded by the National Institute on Aging, was added at Exam IV to investigate the rates and determinants of cognitive impairment.<sup>14</sup> The study reported here uses data collected at Exam III and the HAAS examination.

### Measurement of Cognitive Status

As part of the HAAS, participants were assessed with the Cognitive Abilities Screening Instrument (CASI). Designed for use in cross-cultural studies, the CASI is a composite of the Hasegawa Dementia Screening Scale,<sup>15</sup> the Mini-Mental State Examination,<sup>16</sup> and the Modified Mini-Mental State Examination.<sup>17</sup> These tests are frequently used in epidemiologic and clinical studies of dementia

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and cognitive impairment involving Japanese as well as Western subjects, and they have been validated against clinically diagnosed dementia.<sup>18,19</sup> The CASI includes tests of attention, concentration, orientation, short- and long-term memory, language, visual construction, list-generating fluency, abstraction, and judgment; it has a score range of 0 to 100.<sup>20</sup>

The distribution of CASI scores was highly negatively skewed, with most of the scores on the high end. We therefore used the "CASI cubed" transformation for some analyses, which resulted in an approximately normal distribution. Results of analyses on the cube of the raw CASI score were then back-transformed to the original scale. For other analyses, CASI scores were used to define cognitive function as a trichotomous outcome: good (CASI score greater than or equal to 82), intermediate (CASI score greater than or equal to 74 and less than 82), and poor (CASI score less than 74). These cutpoints correspond approximately to the 32nd and 16th percentiles of the CASI score distribution, respectively. A CASI score of 74 corresponds approximately to a score of 23 on the Mini-Mental State Examination, a level often used to indicate cognitive impairment.<sup>21</sup> The use of slightly lower or higher cutpoints for the CASI scores did not significantly change the results of this study (data available upon request). Of the 226 HAAS participants who were diagnosed with dementia as defined by the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*,<sup>3</sup> 216 (96%) scored less than 74 on the CASI and 222 (98%) scored less than 82.<sup>14</sup>

### Alcohol Intake Variables

Alcohol intake was determined from HHP Exam III information to avoid unreliable recall at the time of the HAAS examination, especially among those with impaired cognition. Exam III participants provided daily intake estimates of beer, wine, liquor, and sake and estimates of the duration of consumption of each type of beverage. Drinking status was described dichotomously as Exam III drinker or nondrinker, as well as by 6 mutually exclusive categories based on the total amount of alcohol consumed: nondrinker; 1 to 2 ounces per month (1 drink or less a week); 3 to 15 ounces per month (up to 1 drink per day); 16 to 30 ounces per month (up to 2 drinks per day); 31 to 60 ounces per month (up to 4 drinks per day); and 61 or more ounces per month (more than 4 drinks per day). For these analyses, men who quit drinking before Exam III were classified as nondrinkers. Results were similar when a separate category for former drinkers was also included.

Although drinking status at HHP Exam III is the primary focus of this report, we also conducted analyses that used alcohol intake in-

formation collected at the HAAS examination. A total of 281 HAAS participants did not provide this information. The nonresponse rate increased progressively across the good (3%), intermediate (10%), and poor (27%) CASI outcome categories. Also, misclassification rates (participants who were "former" or "current" drinkers at Exam III but "never" drinkers at the HAAS examination) were significantly higher among men with poor CASI scores (27%) than among those with intermediate (20%) or good (22%) CASI scores. We therefore emphasize the associations with the Exam III alcohol intake categories in this report.

For drinking history, participants were classified into 4 drinking categories, based on intake estimations at both Exam III and the HAAS examination: men who were (1) nondrinkers at both examinations, (2) moderate drinkers (1–15 ounces of alcohol per month) at both examinations, or (3) heavy drinkers (more than 15 ounces of alcohol per month) at both examinations and (4) men who decreased their consumption of alcohol by any amount between Exam III and the HAAS examination. Excluded from these exploratory analyses because of the small sample size were men who increased their intake of alcohol ( $n=203$ ). An indicator term was also constructed to represent the 281 participants who did not provide alcohol intake information at the HAAS examination.

### Other Covariates

All analyses were controlled for age at the HAAS examination as a continuous covariate. Educational attainment was described by 4 categories, based on highest level of school completion. To control for generation and migrational status, participants were categorized as *issei* (those born in Japan), *nisei* (those born outside of Japan), and *kibei* (those born outside of Japan, but who returned for at least 5 years of boyhood education). Data on cerebrovascular accident were collected continuously through 1994 via a surveillance system established at Exam I<sup>22</sup> and clinical examinations conducted during Exams II through IV. Terms were entered to describe the smoking history of participants up to Exam III, as this was recently found to be significantly related to cognitive performance in this cohort.<sup>23</sup>

### Sample Attrition and Exclusions

A total of 6860 men participated in Exam III. Of this total, 3674 (54%) participated in the HAAS examination, while 2530 (37%) had died by the time of the HAAS examination and 603 (9%) were alive but did not participate. Compared with the 3556 HAAS participants for whom information is complete

(below), Exam III participants who died before the HAAS were significantly older at Exam III (62.5 years vs 58.7 years) and were more likely to be nondrinkers (35% vs 28%) or heavy drinkers (more than 61 ounces alcohol per month) (9% vs 6%), to have been born in Japan (17% vs 7%), to have lower educational attainment, and to have been smokers between Exams I and III. HAAS participants were generally comparable with those men who were alive at the time of the HAAS examination but did not participate. These 2 groups were not significantly different in age, proportion of nondrinkers or heavy drinkers, or migrational status. However, nonparticipants had significantly lower educational attainment and were more likely to have been continuous smokers between Exams I and III (33% vs 27%).

Of the 3674 HAAS participants who also participated in Exam III, 118 (3%) were excluded from analysis because of insufficient information on covariates. The final analytical sample therefore consists of 3556 men.

### Statistical Methods

Means and proportions were used to describe the distribution of the outcome and covariates within the 5 Exam III alcohol consumption categories. We used polytomous logistic regression for nominal outcomes to model the 3 CASI outcomes.<sup>24</sup> Polytomous logistic regression simultaneously models 2 logits: 1 comparing the probability of a poor score with the probability of a good score (the reference category) and the other comparing the probability of an intermediate score with the probability of a good score (the reference category). We used the SAS procedure CATMOD (SAS Institute, Inc, Cary, NC) to estimate the model by means of maximum likelihood techniques.

The parameter estimates from a polytomous model are similar to those obtained if 2 separate binary logistic regressions are performed: 1 comparing the poor with the good score and the other comparing the intermediate with the good score. However, the joint estimation procedure offered in polytomous logistic regression leads to more efficient estimates. The default parametrization of dummy variables in CATMOD is 1 for presence and -1 for absence. Hence, odds ratios are formed as the exponentiation of 2 times the parameter; similarly, normal-based confidence intervals are formed as the exponentiation of 2 times the confidence limits for the parameter. Indicator terms for alcohol intake were entered last into each statistical model, with the nondrinkers serving as the reference. All data analyses were carried out with SAS software.

**TABLE 1—Sociodemographic and Health-Related Characteristics of Subjects, by Honolulu Heart Program Exam III Drinking Status: The Honolulu–Asia Aging Study (HAAS)**

	Total sample <sup>a</sup>	Exam III Alcohol Intake Category (oz/mo) <sup>b</sup>					
		None	1–2	3–15	16–30	31–60	>60
Participants, n	3556	996	751	926	362	311	210
Age <sup>c</sup> at HAAS exam, y	77.8±4.7	78.3±4.9	77.8±4.5	77.1±4.4	78.1±4.6	78.0±4.7	77.8±4.6
Education category, %							
None/primary	3	4	2	2	4	5	4
Secondary	41	44	35	39	45	43	50
High school	39	37	42	40	36	40	33
University/technical	17	15	21	19	15	11	13
Migrational status, %							
Issei (born in Japan)	7	8	5	5	9	9	9
Nisei (born in the US)	84	85	87	85	81	80	81
Kibei (some residence in Japan)	9	8	8	10	10	11	10
Exam I–III smoking history, %							
Nonsmoker	34	45	43	30	25	15	14
Exam I quitter	28	24	25	31	34	34	25
Exam III quitter	11	10	10	10	14	14	16
Continuous smoker	27	21	22	29	27	37	45
History of stroke, %	11	10	12	10	13	14	11

<sup>a</sup>Percentages are of total sample.

<sup>b</sup>Percentages are within each alcohol intake category.

<sup>c</sup>Age±standard deviation.

## Results

Characteristics of the study sample are summarized in Table 1, both as a total and within the Exam III drinking categories. Participants who consumed 1 to 15 ounces of alcohol per month were younger, had slightly higher educational attainment, and were less likely to have been born in Japan than nondrinkers or heavier drinkers. As expected, Exam III drinking status and smoking history were positively related. There was little apparent association between Exam III drinking status and history of stroke.

Men who consumed alcohol at Exam III had significantly higher CASI scores than abstainers (mean CASI±SD=84.9+6.0 vs 83.5+6.4), after adjustment for the covariates listed in Table 1. Drinkers also had a significantly lower risk of a low CASI score (risk ratio [RR]=0.74; 95% confidence interval [CI]=0.85, 0.93) and a lower risk of an intermediate CASI score (RR=0.84; 95% CI=0.59, 1.03) than did nondrinkers. Further analyses indicated that the relationship between drinking and cognitive performance was nonlinear, as men who consumed more than 60 ounces of alcohol per month had the lowest CASI scores and therefore the highest risk of poor CASI outcomes (Table 2). In contrast, men who consumed between 3 and 15 ounces of alcohol per month at Exam III had the highest CASI scores and significantly reduced risk of a poor CASI outcome compared with nondrinkers. Results for the outcome of an intermediate CASI score were less clear, as the lowest risks were found among men who consumed 1 to 2 ounces of al-

cohol per month and among men who consumed between 31 and 60 ounces of alcohol per month.

Ninety-five percent of the Exam III abstainers were again classified as nondrinkers at the HAAS examination. Alcohol intake generally decreased between Exam III and the HAAS examination; 55% of the Exam III drinkers were abstainers at the HAAS examination. Among the Exam III moderate drinkers, 65% were abstainers at the HAAS examination, 10% had increased their alcohol consumption, and the remaining 25% reported alcohol consumption of between 1 and 15 ounces per month. In multivariate analyses, men who reported moderate drinking at both Exam III and the HAAS examination had higher CASI scores than the other alcohol-history groups (Table 3). This group also had approximately one third the risk of a poor CASI outcome compared with men who reported abstinence at both examinations and the lowest risk of intermediate CASI scores (Table 3). Poor and intermediate CASI outcomes were nearly 6 and 3 times more likely, respectively, among men who did not provide alcohol intake estimates at the HAAS examination, compared with abstainers.

## Discussion

The results of the present study suggest a positive association between a history of moderate alcohol consumption and cognitive performance in the elderly, as men who had consumed up to 1 drink a day during middle age

were later found to have significantly better cognitive test results than nondrinkers. The relationship between alcohol consumption and later cognitive performance was nonlinear, however, as men who consumed more than 4 drinks a day in middle age had significantly lower CASI scores and an increased risk of poor cognition. Exploratory analyses also indicated that men who consumed up to 1 drink per day at both Exam III and the HAAS examination had better cognitive performance than men who abstained from alcohol over this period.

A major strength of this study was the longitudinal design, which included assessment of alcohol intake well before cognitive status was ascertained. In cross-sectional studies, the directionality of the relationship between alcohol consumption and cognition is less clear. Retrospective recall of drinking is subject to errors of memory among the elderly, and recalled or concurrent estimations of alcohol intake may be biased by the cognitive status of the respondent. In the present study, we found progressively higher rates of nonresponse or incorrect response to alcohol intake questions at the HAAS examination across the good, intermediate, and poor CASI groups. Similarly, a recent analysis among this cohort indicated that smoking history was less reliably reported by low CASI scorers than by other HAAS participants.<sup>23</sup> Additional strengths of this study include the size of the cohort and the high rates of participation during the follow-up examinations.

As with any prospective study among an elderly cohort, there is a potential survivorship bias in our results related to alcohol intake. A

**TABLE 2—Adjusted<sup>a</sup> Continuous and Trichotomous CASI Outcomes, by HHP Exam III Alcohol Intake Category: The Honolulu–Asia Aging Study**

	Exam III Alcohol Intake Category (oz/mo)					
	None	1–2	3–15	16–30	31–60	>60
Participants, n	996	751	926	362	311	210
CASI, continuous outcome						
Mean predicted CASI score <sup>b</sup>	83.5 <sup>a</sup>	84.2 <sup>a,b</sup>	84.5 <sup>b</sup>	84.0 <sup>a,b</sup>	83.9 <sup>a,b</sup>	81.9 <sup>c</sup>
95% confidence interval	82.0, 84.8	82.7, 85.5	83.2, 85.9	82.5, 85.5	82.3, 85.4	80.1, 83.6
CASI, trichotomous outcome <sup>c</sup>						
Poor vs good CASI score						
No. poor/good scores	182/634	98/546	95/676	56/241	57/208	48/123
Risk ratio	1.00	0.74	0.60	0.72	0.78	1.29
95% confidence interval		0.54, 1.01	0.44, 0.82	0.49, 1.06	0.52, 1.17	0.83, 2.01
Intermediate vs good CASI score						
No. intermediate/good scores	180/634	107/546	155/676	65/241	46/208	39/123
Risk ratio	1.00	0.78	0.89	0.89	0.68	1.02
95% confidence interval		0.59, 1.03	0.69, 1.15	0.64, 1.25	0.46, 1.00	0.67, 1.55

Note. CASI = Cognitive Abilities Screening Instrument; HHP = Honolulu Heart Program.

<sup>a</sup>Adjusted for age, education category, migrational status, Exam I–III smoking history status, and history of stroke.

<sup>b</sup>Back-transformed estimations from regression on the cubic transformation of the raw CASI score. Alcohol intake categories with same letter are not significantly different ( $P > .05$  for  $t$  test).

<sup>c</sup>Cutpoints for trichotomous CASI outcome: good,  $\geq 82$ ; intermediate, 81.9–74; poor,  $< 74$ . Reference category for risk ratio is nondrinkers.

**TABLE 3—Adjusted<sup>a</sup> Continuous and Trichotomous CASI Outcomes, by HHP Exam III and HAAS Examination Drinking Status (n = 3353)<sup>b</sup>**

	Combined Exam III and HAAS Examination Alcohol Intake Category				
	Nondrinkers at Both Exams	Decreased Intake From Exam III	Moderate <sup>c</sup> Drinkers at Both Exams	Heavy <sup>c</sup> Drinkers at Both Exams	Did Not Report Intake at HAAS
Participants, n	860	1497	384	331	281
CASI, continuous outcome					
Mean predicted CASI score <sup>d</sup>	85.1 <sup>a</sup>	85.1 <sup>a</sup>	86.8 <sup>b</sup>	86.0 <sup>ab</sup>	76.2 <sup>c</sup>
95% confidence interval	83.7, 86.5	83.8, 86.4	85.3, 88.1	84.6, 87.4	74.3, 78.0
CASI, trichotomous outcome <sup>e</sup>					
Poor vs good CASI score					
No. poor vs good scores	126/581	195/1067	17/317	38/236	145/74
Risk ratio	1.00	0.86	0.34	0.71	5.83
95% confidence interval	...	0.65, 1.14	0.20, 0.60	0.45, 1.10	3.92, 8.68
Intermediate vs good CASI score					
No. intermediate vs good scores	153/581	235/1067	50/317	57/236	62/74
Risk ratio	1.00	0.85	0.73	0.85	2.69
95% confidence interval	...	0.67, 1.09	0.50, 1.04	0.59, 1.22	1.79, 4.04

Note. CASI = Cognitive Abilities Screening Instrument; HHP = Honolulu Heart Program; HAAS = Honolulu–Asia Aging Study.

<sup>a</sup>Adjusted for age, education category, migrational status, Exam I–III smoking history status, and history of stroke.

<sup>b</sup>Excluded from analyses were men who increased their alcohol intake at the HAAS examination (n = 203), because of small sample size.

<sup>c</sup>Moderate alcohol intake is defined as between 1 and 15 ounces per month, and heavy drinking is defined as more than 15 ounces per month.

<sup>d</sup>Back-transformed estimations from regression on the cubic transformation of the raw CASI score. Alcohol intake categories with the same letter are not significantly different ( $P > .05$  for  $t$  test).

<sup>e</sup>Cutpoints for trichotomous CASI outcome: good,  $\geq 82$ ; intermediate, 81.9–74; poor,  $< 74$ . Reference category for risk ratio is nondrinkers.

U-shaped association between drinking and total mortality was reported after 8 years of follow-up of the original HHP cohort.<sup>25</sup> A more recent study among this cohort did not find significant associations between alcohol consumption and mortality after an approximate follow-up period of 15 years, although there were weak suggestions of a protective effect of light and moderate drinking.<sup>26</sup> We found that, among Exam III participants, abstainers and heavier drinkers (more than 2 drinks a day)

were less likely to survive to participate in the HAAS examination. If light and moderate drinkers live longer in this cohort and the risk of poor cognitive performance increases with age, then light and moderate drinkers would be expected to have a greater risk of poor cognitive performance. We observed the opposite relationship, however, suggesting that our results are not due to differential survivorship.

There have been few previous studies of alcohol intake and cognition among community-

based samples of older persons. Alcohol intake was not significantly related to cognitive performance on any of 4 tests administered to a cohort of elderly East Boston residents, although drinkers who consumed less than 1 ounce of alcohol a day had the best scores on all tests.<sup>7</sup> A subsequent study among this cohort concluded that there was no clear relationship between alcohol intake and change in cognitive function.<sup>9</sup> Launer et al. reported a significantly lower risk of poor cognitive function for Dutch men who

consumed 1 to 2 drinks per day than for nondrinkers.<sup>6</sup> These baseline estimates of alcohol intake were not predictive of 3-year changes in the cognitive performance of these men, however.

Alcohol drinkers among the Framingham Study cohort performed significantly better on half of the components of an 8-test battery of cognitive function than did nondrinkers.<sup>8</sup> A recent study of older Black residents of Indianapolis reported significantly higher cognitive scores among current and former light drinkers (fewer than 4 drinks per week) than among abstainers.<sup>10</sup> Similar to what was found in our study, the poorest performance was found among the heaviest drinkers. Thus, while alcohol intake has not been significantly related to measured changes in cognitive status, the results of our study are consistent with those of most previous studies, which generally indicate that moderate drinkers perform better on a single cognitive assessment than abstainers.

Moderate drinking has previously been associated with a reduced risk of ischemic stroke, which could decrease dementia from vascular causes.<sup>25,27</sup> Mechanisms postulated to provide protection to the heart, such as increases in high-density lipoproteins and prostacyclin, decreases in fibrinogen levels, and inhibition of platelet aggregation, could also reduce the risk of brain infarcts.<sup>25,28–31</sup> Since there is no apparent relationship between alcohol intake and Alzheimer disease,<sup>1</sup> the possible protective association between moderate alcohol consumption and cognition is more likely to be mediated through vascular factors.

Despite these plausible biologic mechanisms, it is possible that the observed associations between moderate drinking and cognitive performance are confounded by unmeasured behavioral habits, or the degree of social adjustment and general psychological condition of the participants.<sup>32</sup> For example, moderate drinkers may be “social drinkers,” elderly men with active social and intellectual diversions. Our study, like most others, is limited in the extent of statistical “control” for these possible influences. However, controlling for responses to HAAS examination questions concerning the participant’s social networks, number of close friends, and participation in community groups did not affect the relationship between Exam III alcohol consumption and cognitive performance. We also considered the possibility that the reference group used in these analyses (the nondrinkers) may be inappropriate since this group may contain healthy abstainers and those who abstain for medical reasons. To address this possibility, we repeated some of these analyses stratified by the health status of the participants, but the results were similar. (Health surveillance information from the HHP was used to categorize participants with respect to the existence

of cancer, heart disease, cerebrovascular accident, diabetes, and other chronic conditions up to 1 year after Exam III.)

The analytic outcomes of the present study are based on a single cognitive examination, so the reliability of the cognitive assessment is limited. However, the CASI has been administered in a follow-up HAAS examination, so future studies can assess the relationship between alcohol consumption and change in cognitive status in this cohort. Finally, the findings from this study among Japanese American men may not be generalizable to populations of European ancestry, since the relative frequencies of the 2 major subtypes of dementia tend to differ between these 2 populations, with proportionally higher estimates of Alzheimer disease among European populations.<sup>14,33</sup>

The consumption of alcohol is common among older people living in the United States.<sup>34,35</sup> In the present study, we found moderate consumption of alcohol in middle age to be associated with good subsequent cognitive performance among these Japanese American men. While these results may add to the growing body of evidence supporting health benefits of moderate alcohol intake, we advise caution in recommending moderate consumption of alcohol for all elderly persons.

Our most reliable estimate of alcohol consumption in this study was made approximately 18 years before the cognitive assessment. We are therefore hesitant to extrapolate those results to alcohol intake in old age, although the less reliable intake estimates made at the HAAS examination also suggested a benefit from moderate consumption. More importantly, however, the health risks of any drinking may outweigh any potential benefits for many elderly people. Preexisting alcohol use disorders, the risk of adverse alcohol–drug reactions, and chronic medical conditions often preclude the use of alcohol altogether. For older persons without contraindications to drinking, we would endorse the current recommended limit of 1 standard drink per day for elderly persons.<sup>36,37</sup> □

## Contributors

D.J. Galanis planned the study, conducted the analyses, and wrote most of the paper, with assistance in the latter activity from C. Joseph, K.H. Masaki, H. Petrovitch, G.W. Ross, and L. White collected the data, helped direct the analyses, and assisted in the production of draft manuscripts and in the responses to the reviews provided by this journal.

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